

**Requested document:****[JP63289951 click here to view the pdf document](#)****LEAD FRAME**

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**Abstract**

**PURPOSE:**To attain an excellent lock effect of a molding resin so as to obtain a lead frame prevented from separation of the molding resin by a method wherein an edge 3 of a mounting section and a lead section of the lead frame is so formed as to have a profile with a inclined area facing toward a front side of the lead frame.

**CONSTITUTION:**An edge 3 of a mounting section 1 and a lead section 2 of a lead frame is so formed as to have a profile with a inclined area 4 facing toward a front side of the lead frame. To form the lead frame mentioned above, for instance, attachment such as oil, contaminant, or the like on the surface of a metallic plate 0.27 mm thick formed of 42 alloy is removed by the use of degreasing solution, and negative-type sensitizing solution is applied onto the both sides of the said metallic plate, which is dried through heating and thereafter is subjected to exposure to light with applying a front pattern 11 and a rear pattern 12 to the both sides. Next, development is performed using warm water for the formation of a resist pattern, and then corrosive solution is sprayed with a nozzle upon the both sides of the said metallic plate and the unneeded part is removed through etching so as to form a lead frame. And, resist is removed using resist stripping agent and then plating is performed thereon.

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LEAD FRAME

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### Claim

A lead frame characterized by the fact that the edges of the mounting section and the lead section of the lead frame are formed with a cross-sectional profile with a slope that slants toward the tip of the lead frame.

### Detailed explanation of the invention

#### Industrial application field

The present invention pertains to a lead frame.

#### Prior art

As shown in Figure 4, in the etching processed lead frame of the prior art, in order to realize the effect of locking the molding resin, a significant side etched portion is left, and edge (5) is formed with central protrusion (6) in the thickness direction.

#### Problems to be solved by the invention

However, the amount of side etching depends on the plate thickness, etching conditions, and balance in the designed pattern dimensions, and it is very difficult to ensure that a stable amount of side etching on all locations of the sites of the lead frame will take place. Consequently, it is impossible to completely prevent separation of the molding resin.

The purpose of the present invention is to solve the aforementioned problems of the conventional methods by providing a lead frame that can achieve an excellent locking effect of the molding resin and prevent separation of the molding resin.

#### Means to solve the problems

In order to realize the aforementioned purpose, the present inventors conducted extensive research. As a result, it was found that when the edge of each portion of the lead frame is formed with a cross-sectional profile whose slope is inclined towards the top of the lead frame, an excellent locking effect can be realized. The present invention was based on this finding.

That is, the present invention provides a lead frame characterized by the fact that the edges of the mounting section and the lead section of the lead frame are formed with a cross-sectional profile with a slope that slants toward the top of the lead frame.

Figures 1a and b illustrate the lead frame of the present invention.

Edge (3) of mounting section (1) and lead section (2) is formed with a cross-sectional profile in which slope (4) is inclined towards the top of the lead frame, that is, from the bottom to the top of the lead frame.

Mounting section (1) and the part of lead section (2) near the mounting section form IC carrying section (5).

According to the present invention, the edge with said slope can be formed with greater stability over the entire region of the lead frame than the edge of the side edge portion in the prior art. Consequently, an excellent locking effect can be realized for the entire region of the lead frame.

### Operation

The edge portion with a cross-sectional profile with a slope that slants towards the top of the lead frame forms an opening portion that is wider at the bottom of the lead frame the top. Also, the surface area in contact with the molding resin is larger. Consequently, the molding resin that fill the opening of the lead frame is fixed reliably, and an excellent locking effect can be realized.

### Application examples

A 0.27-mm-thick 42-alloy sheet was prepared. After oil, dirt and other contaminants attached to the surface of the metal sheet were removed with a degreasing solution or the like, the two surfaces of the metal sheet were coated with a negative type photosensitive solution, such as (MR-S) manufactured by Morohoshi Ink Co., Ltd., followed by heating at 80-100°C for drying. As shown in Figures 2a and b, on the two surfaces, outer pattern (11) and inner pattern (12) are applied and exposed. Figures 2a and b illustrate part of the pattern corresponding to the lead section of the lead frame.

After two patterns (11), (12) were adhered under vacuum, the surfaces exposed with light with a high UV content emitted from high voltage mercury lamps at the same time, followed by development with warm water at 30-45°C to form the resist pattern. Then, etching solution ( $\text{FeCl}_3$  solution with 35-46°Bé and at 50-65°C) was sprayed out from a nozzle to etch off the undesired portion so as to form the lead frame.

Then, a resist separating solution was used to perform the pre-treatment required for plating (treatment with acid, alkali, water washing). After application of the underlying plating, gold-plating was performed. At this time, soft gold plating was performed on the side where the IC chip is to be carried on the lead frame, and hard gold-plating was performed on the opposite side. Because different plating types were applied to the top and bottom sides, respectively, a fixture that masks one side was prepared, and a single-sided plating operation was carried out.

As shown in Figure 3 on aforementioned lead frame (7) reinforcing insulator (21), a polyimide sheet with a thickness of 80  $\mu\text{m}$ , one side of which is coated with thermosetting type

adhesive (trade name JR-2250 polyimide tape for fixing lead frame, product of Nitto Denko K.K.), heated and bonded at 150°C, to form reinforcing insulator (21) on lead frame (7).

Then, a thermosetting epoxy die adhesive was coated at a thickness of 20  $\mu\text{m}$  on the chip die pad portion on said reinforcing insulator (21), and IC chip (22) was set via said adhesive layer on lead frame (7).

Then, by means of wire bonding equipment, 25- $\mu\text{m}$  gold wires (23) were bonded between the IC chip bonding portion and the soft gold-plated terminal portion of the lead frame.

Then, after wire bonding, the transfer mold method was used to seal one side of the IC chip and lead frame with a resin, that is, an epoxy-based transfer molding resin (trade name MP-10, product of Nitto Denko K.K.), followed by cutting into package units, and, as required, polishing of the resin surface to form an IC module with a thickness of 0.65 mm. Also, in Figure 3, (7a) represents the base material of the lead frame; (7b) represents a copper-plated layer; (7c) represents a Ni-plated layer; (7d) represents a soft gold-plated layer; and (7e) represents a hard gold-plated layer.

The IC module prepared as described above was installed on an IC card base material to form an IC card.

In the process for forming said IC module, and in the process in preparing the IC card, no separation of the molding resin from the lead frame took place.

#### Effect of the invention

As explained in detail above, according to the present invention, a lead frame with an excellent locking effect of the molding resin can be obtained.

#### Brief description of the figures

Figures 1a and b illustrate the lead frame of the present invention. Figure 1a is a partial plan view. Figure 1b is a rear view [sic]. Figures 2a and b illustrate the state when patterns are applied to the lead frame base material. Figure 2a is a plan view. Figure 2b is a cross-sectional view. Figure 3 is a cross-sectional view illustrating the IC module formed using the lead frame of the present invention. Figure 4 is a partial cross-sectional view illustrating the state of side etching of the conventional lead frame.

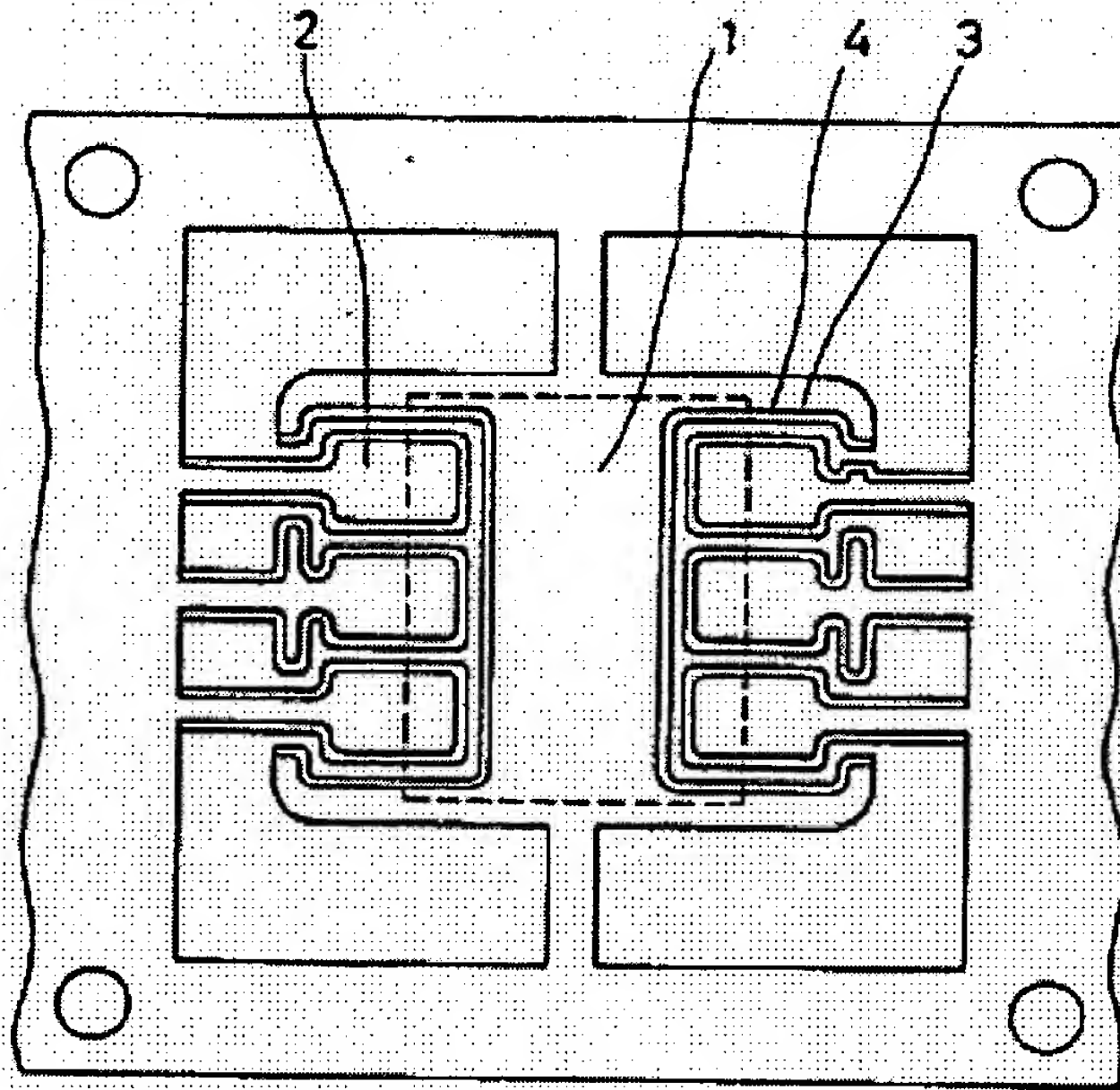


Figure 1a



Figure 1b

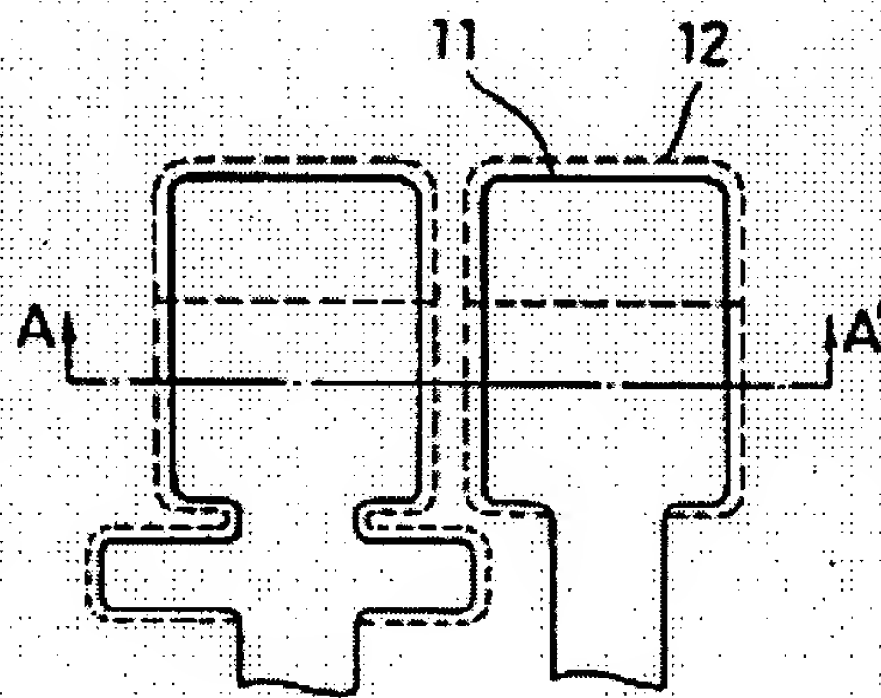
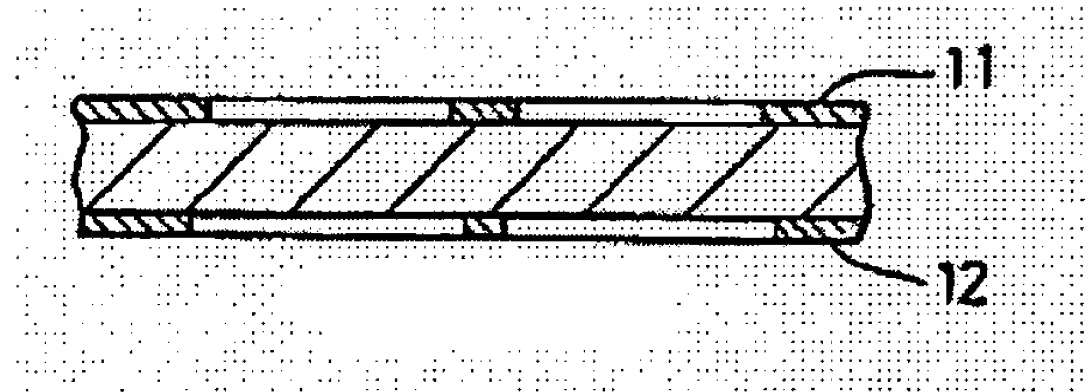


Figure 2a



(A-A) cross section

Figure 2b

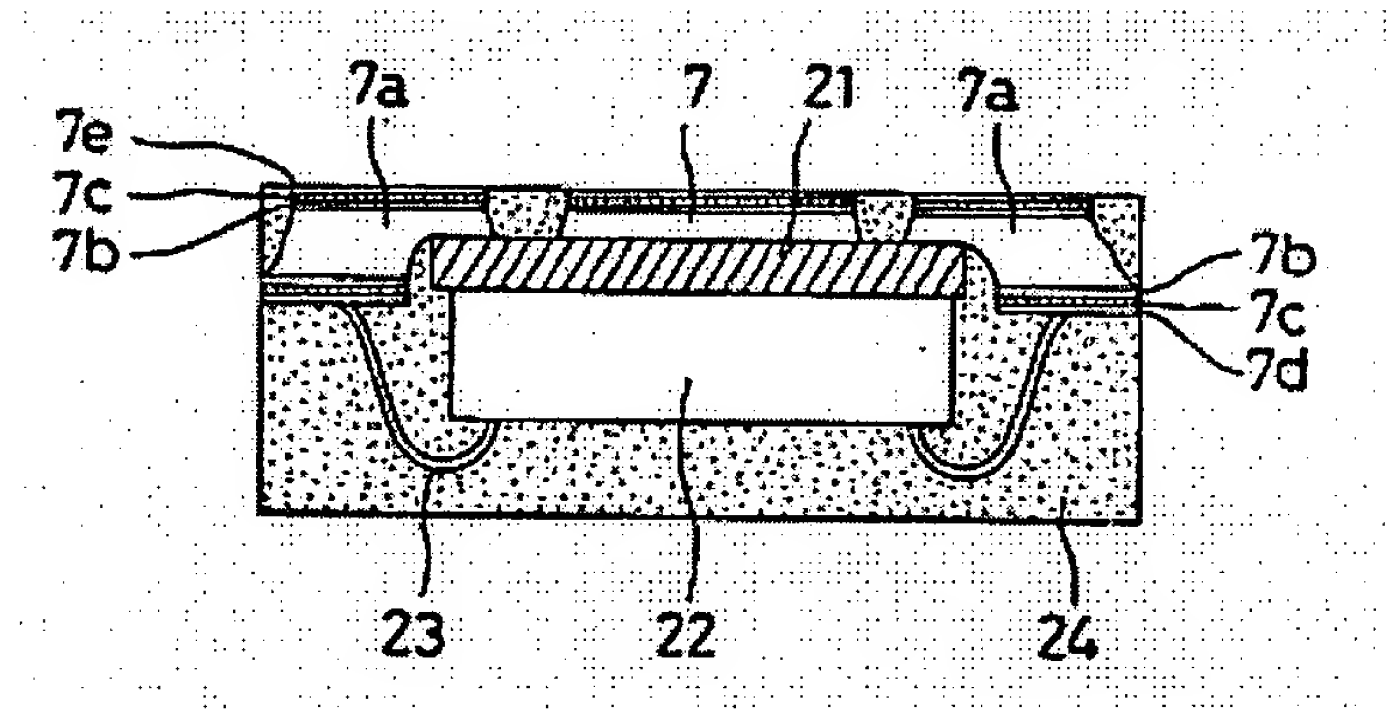


Figure 3

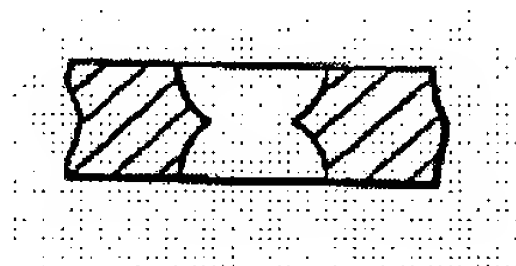


Figure 4